Report for 2004FL57B: Sensitivity of the Hydroperiod of Forested Wetlands to Alterations in Topographic Attributes and Land Use

- Articles in Refereed Scientific Journals:
  - Nachabe, M. H 2006. Spatially Distributed Versus Lumped Parameter Models: A proposed Equivalence between the TOPMODEL and SCS Curve Number Method. Journal of the American Water Resources Association. In press.
  - Said, A., M. Nachabe, M. Ross, and J. Vomacka 2005. Estimating Specific Yield Using Continuous Soil Moisture Monitoring. To appear in the November-December issue of the ASCE, Journal of Irrigation and Drainage Engineering.
  - Nachabe, M. H., N. Shah, M. Ross, and J. Vomacka 2005 . Evapotranspiration of Two Vegetation Covers in Humid Shallow Water Table Environment. Soil Science Society of America Journal, 69:492-499.
  - DeSilva, M., M. H. Nachabe, J. Simunek, and R. Carnahan 2005. Simulating Root Water Uptake from a Heterogeneous Vegetation Cover using Finite Element Modeling. In press, ASCE, Journal of Irrigation and Drainage Engineering.
  - Nachabe, M. H., C. Masek, and J. Obeysekera 2004. Observations and Modeling of Profile Soil Water Storage above a Shallow Water Table. Soil Science society of America Journal, Vol. 68, No. 3.
  - Hernandez, T., M. Nachabe, M. Ross, and J. Obeysekera 2004. Runoff from Variable Source Areas in Humid, Shallow Water Table Environments. Journal of the American Water Resource Association, vol. 39, no. 1, pp.75-85.
  - DeSilva, M. and M. H. Nachabe 2006. Influences of Land Use Change and Topographic Attributes on Hydrology of Shallow Water Table Environments. In review, Ecological Modelling.

Report Follows

Report for:
Vulnerability of the hydroperiod of forested wetlands to alterations in topographic attributes and land use

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This research offered a unique opportunity to enhance our understanding of the dynamics of Variable Saturated Areas (VSA). Soils in VSA are subject to routine cycles of wetting and drying which drive many ecological functions of the watershed including: maintaining a healthy hydroperiod for forested wetlands, sustaining fish and wading bird habitat, and providing sediments and saturation excess runoff to adjacent streams. Water table and soil moisture were monitored along a transect incorporating an upland area with grass and a lowland forested zone within a VSA. The objective was to understand hydrological connectivity and fluxes across distinct landscapes, and to determine how upland areas support the cycle of inundation in VSA. Detailed soil analysis was carried out to estimate the soil hydraulic properties and to fit the van Genuchten model of soil properties. Optimization algorithms were used to fine-tune the soil hydraulic parameters by matching observed and simulated ground water levels. Varying rooting depths were assigned to different segments of the spatial domain to represent the mix vegetation, which consisted of a riparian zone with relatively deep roots, and a pastureland zone with shallow roots. Two-dimensional finite elements simulations were carried with different surface cover boundary conditions to test the sensitivity of VSA and root-water-uptake to landscape change. Findings of this research were documented in six journal articles published in a diverse literature to ensure maximum impact.

Impact:
Partnerships supported through this project included technical collaborations with South Florida Water Management District, Southwest Florida Water Management District, and Tampa Bay Water. The PI worked with staff from these agencies to better achieve the goals of the project by increasing the awareness on the sensitivity of VSA to land use change. Selected staff from these agencies served as members on graduate students committees and attended professional presentations related to this project. Funding from project supported the dissertations of three graduate students. All graduate students have reached to their community by giving technical presentation and publishing in both refereed journals and conference proceedings. Output included convening a technical session by the PI at the annual AGU meeting in San Francisco in December 2003. Graduate students on this project participated in technical presentation at the annual AGU meetings, the annual AWRA conference in Miami, and the joint Conference on the Science and Restoration of the Greater Everlglades and Florida Bay Ecosystem. In addition, the PI contributed a poster presentation in the annual CSREES, National Water Quality Conference in Clearwater, Florida.